

Low frequency catalogues of the CATS database

O.V.Verkhodanov¹, S.A.Trushkin¹, H.Andernach²

¹ Special Astrophysical Observatory, Nizhnij Arkhyz, Russia, 357147

² Depto. de Astronomía, Apdo. Postal 144, Univ. Guanajuato, Guanajuato, Mexico

E-mail: vo@sao.ru, satr@sao.ru, heinz@astro.ugto.mx

Abstract

The authors describe the largest existing publicly accessible radio source database CATS (“astrophysical CAtalogues Supporting system”). CATS contains more than 300 catalogues of objects detected in different (but mostly radio) wavelength ranges. These include catalogues from the largest existing surveys, like NVSS, FIRST, WENSS, TXS, GB6, IRAS, ROSAT, PGC, MCG, etc. Thus CATS allows to draw samples of objects to study a great variety of astrophysical problems.

CATS also includes all of the largest low-frequency catalogues published so far : UTR(10–25 MHz), Culgoora (80, 160 MHz), Cambridge (38, 151, 178 MHz), Miyun (232 MHz), WENSS (325 MHz), Texas (365 MHz), Bologna and Molonglo (408 MHz) etc., and allows the user to operate with them.

The creation of the CATS database (<http://cats.sao.ru>) was motivated on the one hand by the measurements of radio continuum spectra with the RATAN-600 telescope (by two of us, O.V. and S.T.), and, on the other hand, by the activity of the third author (H.A.) in collecting the astrophysical catalogues. CATS became operational in 1996.

The main objective of the CATS database is to help a user to operate with a large number of astrophysical catalogues which have been published in different formats, each one including a somewhat different set of observational parameters.

Among the options accessible to CATS users we mention

- Request short descriptions of each catalogue, or print a list of catalogues covering the required sky areas.
- Select objects from one or more catalogues by coordinate, flux, spectral index, frequency, etc.
- Select objects from one or more catalogues for many sky patches defined by position and size (e.g. for cross-ID with other catalogues).
- Display radio spectra of selected sources.

Among other applications, CATS may be used for object identification, source counts in different wavelength ranges, or the study of statistical properties of different source populations. Standard access to CATS is via WWW at <http://cats.sao.ru>, or e-mail (cats@sao.ru), or anon. FTP. Batch requests to extract objects from large lists of sky regions are supported via

e-mail. Standard formats of input and output of CATS are discussed, and some optimized ways of interaction with CATS are shown.

Our database comprises more than 300 catalogues. At present, 140 of these catalogues include data at frequencies less or equal 1400 MHz. The largest or the most important of them are all the Cambridge catalogues from 3C to 8C (38, 151, 178, 408 MHz), the VLA FIRST and NVSS catalogues at 1400 MHz, the 2nd and 3rd Bologna surveys at 408 MHz, the Westerbork catalogues at 325 MHz, the Texas catalogue at 365 MHz, the Parkes catalogues at several frequencies, the GB catalogues, the RATAN-600 catalogues. There are further dedicated catalogues of radio sources, like e.g. those in clusters of galaxies, by Slee, Owen or Reynolds. The CATS database includes a large number of Galactic radio sources, supernova remnants and their maps, observed with the RATAN-600, Bonn, Ooty, VLA and other telescopes.

Several basic catalogues at low frequencies are given in Table, containing the main survey parameters. This table also includes catalogues obtained at high radio frequencies, at other wavelength ranges and several mixed catalogues.

The standard access to the CATS database is provided in three different ways:

1. <http://cats.sao.ru>
2. e-mail: cats@sao.ru (an empty email delivers a help file)
3. <ftp://cats.sao.ru> (anonymous FTP)

HTTP and e-mail access permits the user to obtain information from catalogues in selected areas, and to search for cross-identifications of entries in CATS with user-specified input lists.

Here are some simple examples of e-mail requests which are very convenient for a slow network transfer:

1. Search an area defined by limits in equatorial coordinates for objects drawn from all radio catalogues, with a flux density higher than 500 mJy:

```
mail cats@sao.ru
cats select
ra min=12:30 max=12:40:15. dec > 0 < 5' 46"
catalogs r epoch=1950 flux > 500
cats end
```

2. Request letter for the coordinate cross-identification of 3 sources in all the CATS catalogs with errors by x (RA) and y (DEC):

```
mail cats@sao.ru
cats match catalogs a
window box x=60" y=2'
sources:
s1 02:02:00 +31:23:16 1950
s2 02:23:10 00:03:00 1950
s3 21:26:33.9 -18:34:33.0 1950
cats end
```

Table 1: Basic catalogues of the CATS data base

Freq (MHz)	Name	Year of publ.	RA(h) or l(d)	Decl(deg) or b(d)	HPBW arcmin	S_{min} (mJy)	N of objects	n degs ²
10-25	UTR-2	78-95	0-24	>-13	25..60	10000	1754	0.2
38	8C	90/95	0-24	>+60	4.5	1000	5859	1.7
80	CUL1	73	0-24	-48,+35	3.7	2000	999	0.04
80	CUL2	75	0-24	-48,+35	3.7	2000	1748	0.06
151	6CI	85	0-24	<+80	4.5	200	1761	5.7
151	6CII	88	8.5-17.5	+30,+51	4.5	200	8278	4.1
151	6CIII	90	5.5-18.3	+48,+68	4.5	200	8749	4.5
151	6CIV	91	0-24	+67,+82	4.5	200	5421	3.8
151	6CVa	93	1.6- 6.2	+48,+68	4.5	300	2229	3.0
151	6CVb	93	17.3-20.4	+48,+68	4.5	300	1229	2.6
151	6CVI	93	22.6- 9.1	+30,+51	4.5	300	6752	2.7
151	7CI	90	(10.5+41)	(6.5+45)	1.2	80	4723	9.7
151	7CII	95	15-19	+54,+76	1.2	100	2702	6.5
151	7CIII	96	9-16	+20,+35	1.2	150	5526	4.0
160	CUL3	77	0-24	-48,+35	1.9	1200	2045	0.08
178	4C	65	0-24	-7,+80	15x7.5	2000	4844	0.2
232	MIYUN	96	0-24	+30,+90	3.8	100	34426	3.3
325	WENSS	98	0-24	+30,+90	0.9	18	229420	22
327	WSRT	91	5 fields	(+40,+72)	1.0	3	4157	50
365	TXS	96	0-24	-35.5,+71.5	.1	250	66841	2.
408	MRC	81/91	0-24	-85,+18.5	3	700	12141	0.5
408	B2	70-73	0-24	+24,+40	3 x10	250	9929	3.1
408	B3	85	0-24	+37,+47	3 x 5	100	13354	5.2
408	MC1	73	1-17	-22,-19	2.7	100	1545	2.3
408	MC4	76	0-18	-74,-62	2.7	130	1257	1.0
608	WSRT	91	sev.fields	(40, 72)	0.5	3	1693	(50)
611	NAIC	75	22-13	-3,+19	12.6	350	3122	0.6
1400	GB	72	7-16	+46,+52	10x11	90	1086	2.0
1400	GB2	78	7-17	+32,+40	10x11	90	2022	2.2
1400	WB92	92	0-24	-5,+82	10x11	150	31524	0.7
1400	NVSS39	98	0-24	-40,+90	0.9	2.0	1814748	58.
1400	FIRST5	98	7.3,17.4	22.2,57.6	0.1	1.0	382892	73.
1400	FIRST5	98	21.3,3.3	-11.5,+1.6	0.1	1.0	54537	73.

Table 1: Basic catalogues of the CATS data base (continued)

Freq (MHz)	Name	Year of publ.	RA(h) or l(d)	Decl(deg) or b(d)	HPBW arcmin	S_{min} (mJy)	N of objects	n degs ²
1400	PDF	98	1.1-1.3	-46,-45	0.1-0.2	0.1	1079	343
2700	PKS	(90)	0-24	-90,+27	8	50	8264	0.3
3900	Z	89	0-24	0,+14	1.2x52	50	8503	1.7
3900	RC	91/93	0-24	4.5,5.5	1.2x52	4	1189	3.2
3900	Z2	95	0-24	0,+14	1.2x52	40	2944	0.6
4775	MIT-GB	83	22.3-13	-3,+19	2.8	40	2661	0.5
4850	MG1-4	86-91	var.	0,+39	3.5	50	24180	1.2
4850	87GB	91	0-24	0,+75	3.5	25	54579	2.7
4850	BWE	91	0-24	0,+75	3.5	25	53522	2.7
4850	GB6	96	0-24	0,+75	3.5	18	75162	3.7
4850	PMNM	94	0-24	-88,-37	4.9	25	15045	1.8
4850	PMN-S	94	0-24	-87.5,-37	4.2	20	23277	2.8
4850	PMN-T	94	0-24	-29,-9.5	4.2	42	13363	2.0
4850	PMN-E	95	0-24	-9.5,+10	4.2	42	11774	1.7
4850	PMN-Z	96	0-24	-37,-29	4.2	70	2400	1.0
<hr/>								
			l	$ b $				
31	NEK	88	350-250	< 2.5	13x 11	4000	703	0.7
151	7C(G)	98	80-180	< 5.5	1.2	100	6262	4.8
327	WSRTGP	96	43-91	< 1.6	1.0	10	3984	25
1400	GPSR	90	20-120	< 0.8	0.08	25	1992	8.9
1408	RRF	90	357-95.5	< 4.0	9.4	98	884	1.1
1420	RRF	98	95.5-240	$-4 - 5$	9.4	80	1830	1.5
1400	GPSR	92	350-40	< 1.8	0.08	25	1457	8.1
2700	F3R	90	357-240	< 5	4.3	40	6483	2.7
4875	ADP79	79	357-60	< 1	2.6	120	1186	9.4
5000	GT	86	40-220	< 2	2.8	70	1274	1.8
5000	GPSR	94	350-40	< 0.4	0.07	3	1272	26.
5000	GPSR	79	190-40	< 2	4.1	260	915	1.1

Examples of the largest non-radio catalogues in CATS

λ	Name	Publ	RA	Dec	N	N/deg ²
opt	PGC	89	0-24	-90,+90	73197	3.6
opt	MCG	75	0-24	-33.5,+90	31886	
ir	IRASPSC	87	0-24	-90,+90	245889	11.9
ir	IRASFSC	89	0-24	$ b > 10$	235935	13.8
ir	IRASSSC	89	0-24	-90,+90	43886	
Xray	ROSAT	95	0-24	-90,+90	74301	3.6

We are grateful to Vladimir Chernenkov for his help with the software design and for organizing the remote access systems for CATS.